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ABSTRACT

Procedure of Operationalizing Advance Organizers (POOAO) is a new procedure that can be utilized by researchers to construct effective advance organizers. The procedure is based mainly on the Ausubelian propositions related to advance organizers and on empirical findings of advance organizer research. The eight steps involved in the procedure are outlined and discussed. They include: (1) analyzing learning materials; (2) mapping the cognitive structures of learners; (3) determining characteristics of the advance organizer; (4) estimating the readability of the advance organizer; (5) checking the understandability of the advance organizer; (6) assessing the study time of the advance organizer; (7) valuing the validity of the advance organizer; and (8) revising the advance organizer. (Author/JN)

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OPERATIONALIZING ADVANCE ORGANIZERS:

A NEW PROCEDURE

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ABSTRACT

The purpose of this article is to propose a new procedure that can be utilized by researchers to construct effective advance organizers. This procedure is called the Procedure of Operationalizing Advance Organizers (POOAO). It includes the follwong eight steps: (1) Analyzing the learning materials, (2) mapping the cognitive structure of the learners, (3) determining the characteristics of advance organizer, (4) estimating the readability of the advance organizer, (5) checking for the understandability of the advance organizer, (6) assessing the study time of the advance organizer, (7) valuing the validity of the advance organizer, and (8) revising the advance organizer.

Introduction

Ausubel (1960) has suggested that students should be presented with statements containing an orderly arrangement of highly generalzed concepts needed in their cognitive structure before learning new concepts. Ausubel refers to such statements as "Advance Organizers."

For example, before students are taught the circulatory system they could be presented with the following statement (advance organizer):

> The circulatory system is like the sanitary system of a city. In both there is a pumping station, pipelines with varying sized pipes, a filtration plant, an exchange terminal, and capacity of disposal waste. (Eggen, Kauchak, & Harder, 1979, p. 282.)

Ausubel (1968) defines advance organizers as "appropriately relevant and inclusive introductory materials...introduced in advance of learning...and presented at a higher level of abstraction, generality, and inclusiveness (p. 148).

Much criticism has been leveled against the advance organizer strategy (Barnes & Clawson, 1975; Hartley & Davis, 1976; Rickards, 1980). The most common criticism is that the Ausubel definition of the advance organizer is vague and ambiguous. In this connection, Hartley and Davis (1976) said:

> Most of the research seems confused...It is now recognized that there is currently no acceptable way of generating or recognizing advance organizers. This uncertainty has led at least one researcher to complain, "If it works, it's an advance organizer; if it doesn't work, it isn't." (p. 256)

Ausubel (Ausubel, Novak, & Hanesian, 1978) has argued that this common criticism is unjustified. He claims to have spent 23 pages discussing organizers in an earlier book (Ausubel, 1968) including a discussion of how to construct an organizer on the topic of biological evolution.

Still, Ausubel's definition of the advance organizer is logical rather than operational. It explains conceptually what advance organizer is but does not specify how it is to be constructed (Clarke & Bean, 1982).

However, Ausubel (1978) has suggested a simple procedure of constructing an advance organizer. He indicated that one can identify the organizer by simple comparison with its accompanying learning passage and from knowledge of the pupils' prior knowledge. At a more sophisticated level of methodology, one can obtain consensus among judges that the organizer actually fulfills its purported criteria in relation to the learning passage, and one can map existing concepts in cognitive structure either through pretests or by means of Piagetian clinical interviews. Unfortunately, this procedure has not completely solved the problem of operationalizing the advance organizers. For example, no specific step suggested in this procedure relates to selecting the content (information) included in the organizer.

Some other procedures have been proposed for operationalizing the organizers (see for example, Barron, 1969; Clawson & Barnes, 1974; Singleton, 1979). These procedures seem to have some limitations. For example, those procedures do not include the step of mapping the cognitive structure of the learners. For Ausubel, this mapping is a major step towards constructing the organizers (Ausubel, 1978).

Purpose

The purpose of this article is to propose a new procedure that can be utilized by researchers to construct effective advance organizers. This procedure is called: The Procedure of Operationalizing Advance Organizers (POOAO). The procedure is based mainly on the Ausubel propositions related to advance organizers (Ausubel, 1960, 1963, 1968, 1978). It is also based on the empirical findings of advance organizer research (Kozlow, 1978; Mayer, 1979).

The Procedure of Operationalizing Advance Organizers

The procedure of operationalizing advance organizers (POOAO) consists of the following eight steps (Figure 1):

1. Analyzing the learning materials
2. Mapping the cognitive structures of the learners
3. Determining the characteristics of the advance organizer
4. Estimating the readability of the advance organizer
5. Checking the understandability of the advance organizer
6. Assessing the study time of the advance organizer
7. Valuing the validity of the advance organizer
8. Revising the advance organizer

Insert Figure 1 about here

Step 1: Analysis of Learning Materials

The learning materials are the passages or lessons to be learned. These materials are usually preceeded by the advance organizers.

The purpose of analysis of these materials proceeds in the following three substeps (figure 2):

a) Determining the organizatior of the materials. Learning materials should preferably be disregarded if they contain built-in organizers and proceed deductively, ie., proceed from regions of lower to greater differentiation (higher to lower inclusiveness). Much of the potential benefit derivable from advance organizer will not be actualized with such materials (Ausubel et al., 1978, p. 172).

b) Assessing the familiarity of the materials. Preferably, learning materials that are very familiar should be excluded. Mayer (1979) found that

the organizers seem to be less effective with such types of materials.

The researcher could assess familiarity of the materials by using some techniques such as interviews, questionaires (Singleton, 1979) and achievement tests (Ausubel, 1960). This assessment is preferably conducted on a random sample drawn from the target population. Also, the researcher may consider the opinions of the teachers concerning the familiarity of the materials.

c) Extracting the major ideas (subsumers) contained in the materials. Major ideas are in the form of superordinate concepts, principles (generalizations) and conceptual schemes that are contained in the learning materials.

One approach that might help to extract the major ideas from the learning materials is to construct a "concept map" (Novak et al., 1981; Stewart, Van Kirk, and Rowell, 1979). The concept map is a pyramid or tree-type diagram which shows the relationships among the ideas and also shows which ideas are subsumed by others. It should be possible to identify superordinate ideas which subsume the entire structure. These superordinate ideas are the "subsumers" of all information included in the learning material.

Insert Figure 2 about here

Step 2: Mapping the Cognitive Structure of the Learners.

By cognitive structure, Ausubel means a person's knowledge of a particular subject matter at any given time and how well organized, clear and statable it is (Ausubel, 1963, p. 27). In other words, cognitive structure has to do with what kind of prior knowledge of a field is in our minds; how much of it is there; and how well it is organized (Weil & Joyce, 1978, p. 202).

Mayer (1979) indicated that the advance organizers are likely to be more effective when they contain subsumers that are not part of the cognitive structure of the learners. Accordingly, the researcher needs to map the cognitive structure of those learners to establish presence or absence of these subsumers.

This mapping could also be conducted on the same random sample used previously to determine the familiarity of the learning materials (see step 1,b).

There are many different techniques that have been used to map the cognitive structure. Some of these techniques are 1) clinical interviews; 2) concept map line labeling task; 3) tree construction line labeling task; 4) concept relation task; and 5) sentence generation task. More details about these techniques are available elsewhere (e.g., Stewart, 1980).

Preferably, learners who possess the subsumers should be disregarded (Lawton and Wanska, 1977).

It must be noted that mapping cognitive structure should be restricted to the subsumers only. Therefore pretesting subjects on all information included in the learning material does not constitute an appropriate test of whether or not the subjects possess the subsumers. (For more details see: Kozolow, 1978.)

Step 3: Determining the Characteristics of Advance Organizers.

To determine the characteristics of the advance organizer, the researcher needs to consider the feedback available from the above two steps, and the learner attributes (e.g., age, group, grade level, developmental levels, general ability).

There are three characteristics of the advance organizers that the reseracher should be specific about: 1) type; 2) degree of abstractness; and 3) format.

a) Type (expository or comparative organizers). Ausubel (1978) describes two different types of advance organizers - one to be employed when the new material is completely novel, and the other when it is somewhat familiar. The first is termed as "expository organizer" since it presents a description of exposition of the relevant concepts (subsumers). The second is called a "comparative organizer" since it is likely to make use of similarities and differences between the new ideas included in the learning materials and the related ones in the cognitive

structure of the learners.

Operationally the content of the expository organizer is built around the major ideas (subsumers) extracted previously from the learning material (see step 1, c). An example of a expository organizer is:

> The word pollution can be defined as the poisoning of the enviroment. When our air and water become impure or contaminated man and his enviroment can be harmed. A polluted enviroment can poison humans. The ocean and other bodies of water are also threatened. (Singleton, 1979, p. 120.)

As the above example shows, the major idea (e.g., concept of pollution) must be presented in familiar terms and illustrated further with examples (see also: Ausubel et al., 1978, p. 173). Other examples of expository organizers can be found in Eggen et al. (1979), and Novak (1979) among others.

On the other hand, the comparative organizer is normally constructed in the form of analogies. These analogies relate the major new ideas of the learning materials to familiar ideas existing in the cognitive structure of the learners.

An example of a comparative organizer is:

> An electrical system can be compared to a water system. Water flows through the pipes of a water system. Electricity can be considered as "flowing" through the wires of an electrical system. Wire is the pipe that electricity "flows" through. Volts is the term for electrical pressure. Milliampers is the term for electrical "volume." (Gentner and Gentner, 1982, pp. 15-16.)

Of course, the comparative organizers will be effective if the analogies utilized are well constructed. Comparative organizers could also present differences as well as similarities between old ideas possessed by the learners and new ideas to be learned. (For more details see Ausubel & Fitzgerald, 1961). Details about constructing analogies can be found elsewhere (e.g., Gentner, 1980; Gentner & Gentner, 1982).

The decision of the researchers to use the expository or comparative organizer is based on the familiarity of the learning materials. Expository organizers are

preferably chosen when the material is unfamiliar and when the learners have few related subsumers in their cognitive structure. If the material is somewhat familiar and can be related to other ideas possessed by the learners, the advance organizer should be comparative in nature.

b) Abstractness (concrete - abstract). The decision to use concrete organizers or abstract organizers depends on the cognitive developmental stages as explained by Piaget (Inhelder and Piaget, 1958). In general, learners who are in the concrete operational stage may benefit more if presented with concrete organizers. On the other hand, abstract organizers seem to be more effective with those in the formal operational stage. Details about measuring these cognitive stages are available elsewhere (e.g., Lawson, 1978)

Ausubel (1968, p. 355) recommended that advance organizers intended for elementary school pupils should be presented at a lower level of abstraction and should make extensive use of concrete empirical props. See Jones (1981) for more details about constructing the concrete and abstract organizers.

c) Format (written - non-written). The selection of advance organizer's format is based on variables such as reading ability of the learners and the mode of presenting the advance organizer.

In general, the written format (prose - passage) is normally utilized when the students are good readers and when the mode of presentation is reading. Otherwise, the non-written format is utilized. The non-written format includes teacher oral introduction; audio cassete; T.V. and slide presentations; manipulative materials; demonstrations; models; graphs; flowcharts; diagrams; field trips and others.

Step 4: Estimating the Readability of the Advance Organizers.

This step is desirably executed if lengthily written organizers are utilized.

Fry readability formula (Fry, 1977) is one of the best techniques that can be used to estimate this readability. The organizer seems to be more effective as its readability level approaches the grade level of the subjects (Kozlow, 1978).

Step 5: Checking the Understandability of the Advance Organizer.

A simple procedure to check the understandability of an organizer is to study the reactions of a random sample of subjects given that organizer. At a more sophisticated level of methodology, the investigator could look for the difference in performance between two random samples; one is given the advance organizer, the other is not. This performance is measured by the mean score of a posttest. This test includes questions related to information contained in the advance organizer only. These questions should not cover any information in the learning material (Ausubel, 1960). Moreover, these questions should measure the ability of the subjects to comprehend rather than to memorize the organizer. See Anderson (1972) for more details about the assessment of comprehension ability.

Step 6: Assessing the Study Time of the Advance Organizer.

Kozlow (1978) found that the effect of advance organizers increase as the learners are allowed enough time to study it. A simple method to estimate the study time is to present the organizer to a random sample. Then the time taken by each subject to study the organizer is recorded. The average time could be considered the "study time." It must be noted that the time taken by each subject is calculated from the moment the advance organizer is presented to him until he reports that he understands it. This method is similar to that being used in educational measurement to estimate text time.

Needless to say, the researcher can use the same random sample to execute simaltaneously some of the above steps. This sample should be disregarded because it may contaminate the findings.

Step 7: Valuing the Validity of the Advance Organizers.

The advance organizer is valid if it contains subsumers (major ideas) that match the basic ideas of the learning material.

This validity is desirably determined by a panel of judges or experts (Ausubel, 1978). Both the organizer and learning material should be given to those judges. The percentage of agreement among the judges reflect the degree of validity of the organizer.

Step 8: Revising the Advance Organizer.

The researcher may need to revise the advance organizer in the light of the feedback he obtained from the above steps.

Summary

Research has suffered from the lack of an operational definition of advance organizer. A new procedure is suggested in this article to construct effective organizers. This procedure is called "The Procedure of Operationalizing Advance Organizers" (POOAO). It includes the following eight steps: 1) Analyzing the learning materials; 2) mapping the cognitive structure of the learners; 3) determining the characteristics of advance organizers; 4) estimating the readability of the advance organizer; 5) checking for the understandability of the advance organizer; 6) assessing the study time of the advance organizer; 7) Valuing the validity of the advance organizer; and 8) revising the advance organizer.

REFERENCES

Anderson, R. How to construct achievement tests to assess comprehension. Review of Educational Research, 1972, 42, 145-170.

Ausubel, D.P. The use of advance organizers in the learning and retention of meaningful verbal material. Journal of Educational Psychology, 1960, 51, 267-272.

Ausubel, D.P. The psychology of meaningful verbal learning. New York: Grune and Stratton, 1963.

Ausubel, D.P. Educational psychology:A cognitive view. New York: Holt, Rinehart, and Winston, 1968.

Ausubel, D.P. In defense of advance organizers: A reply to the critics. Review of Educational Research, 1978, 48, 251-257.

Ausubel, D.P., & Fitzgerald, D. The role of discriminability in meaningful verbal learning and retention. Journal of Educational Psychology, 1961, 52, 266-274.

Ausubel, D.P., Novak, J.D., & Hanesian, H. Educational psychology: A cognitive view (2nd ed.). New York: Holt, Rinehart, and Winston, 1978.

Barnes, B.R., & Clawson, E.U. Do advance organizers facilitate learning? Recommendations for further research based on analysis of 32 studies. Review of Educational Research, 1975, 45, 637-659.

Barron, R.F. The use of vocabulary as advance organizers. In H.L. Herber & P.L. Sanders (Eds.), Research in reading in content areas: First year report. Syracuse, NY: Syracuse University, Reading and Language Arts Center, 1969.

Clark, C.H., & Bean, T.W. Improving advance organizer research: Persistent problems and future directions. Reading World, 1982, 22, 2-10.

Clawson, E.U., & Barnes, B.R. The effects of organizers on the learning materials in the elementary grades. Journal of Experimental Education, 1973, 42(1),11-15.

Eggen, P.D., Kauchak, D.P., & Harder, R.J. Strategies for teachers: Information processing models in the classroom. Englewood Cliffs, NJ: Prentice Hall, 1979.

Fry, E. Fry's readability graph: Clarifications, validity, and extension to level 17. Journal of Reading, 1977, 21, 243-252.

Gentner, D. The structure of analogical models in science. Technical Report No. 4451, Bolt, Beranek, and Newman, Inc., July 1980.

Gentner, D., & Gentner, D. Flowing water or teeming crowds: Mental modes of electricity. Technical Report No. 4981, Bolt, Beranek, and Newman, Inc., May 1982.

Hartley, J., & Davis, I.K. Preinstructional strategies: The role of pretests, behavioral objectives, overviews, and advance organizers. Review of Educational Research, 1976, 46, 239-265.

Inhelder, B., & Piaget, J. The growth of logical thinking from childhood to adolescence (A. Parson & S. Milgram, trans.), New York Basic Books, 1958.

Jones, E.E. The selective facilitative effects of concrete organizers and abstract organizers on targeted achievement groups' learning. Paper presented at 54th meeting of National Association for Research in Science Teaching, Grossingers in the Catskills, New York, 1981.

Kozlow, M.J. A meta-analysis of selected advance organizer research reports from 1960-1977. (Docotral dissertation, The Ohio State University, 1978). Dissertation Abstract International, 1979, 39, 5047B (University Microfilm No. DEL79-08165)

Lawson, A.E. The development and validation of a classroom test of formal reasoning. Journal of Research in Science Teaching, 1978, 15, 11-24.

Lawton, J.T., & Wanska, S.K. Advance organizers as a teaching strategy: A reply to Barnes and Clawson. Review of Educational Research, 1977, 47, 233-244.

Mayer, R.E. Twenty years of research on advance organizers: Assimilation theory is still the best predictor of research. Instructional Science, 1979, 8 , 133-167.

Novak, J.D. A theory of Education, Ithaca: Cornell University Press, 1977.

Novak, J.D., and others. The use of concept mapping and Gowins "V" mapping instructional strategies in junior high school science. National Science Foundation, Washington, D.C.; Shell Companies Foundation, New York, N.Y. Grant No. NSF-SED 78-16762, 1981. (ERIC Document Reproduction Service ED 200 437).

Rickards, J.P. Notetaking, underlining, inserted questions, and organizers in text: Research conclusions and educational implications. Educational Technology, 1980, 20(6), 3-11.

Singleton, R. The effects of upward bound students' use of advance organizers as an aid to reading comprehension of selected expository material (Doctoral dissertation, University of Florida, 1979). Dissertation Abstracts International, 1980, 40, 4392A (University Microfilm No. 8002897)

Stewart, J. Techniques for assessing and representing information in cognitive structure. Science Education, 1980, 64, 223-235.

Stewart, J., Van Kirk, J., & Rowell, R. Concept maps: A tool for use in biology teaching. The American Biology Teacher, 1979, 41, 171-175.

Weil, M., & Joyce, B. Information processing models of teaching. Englewood Cliffs, N.J.:Prentice Hall, 1978.

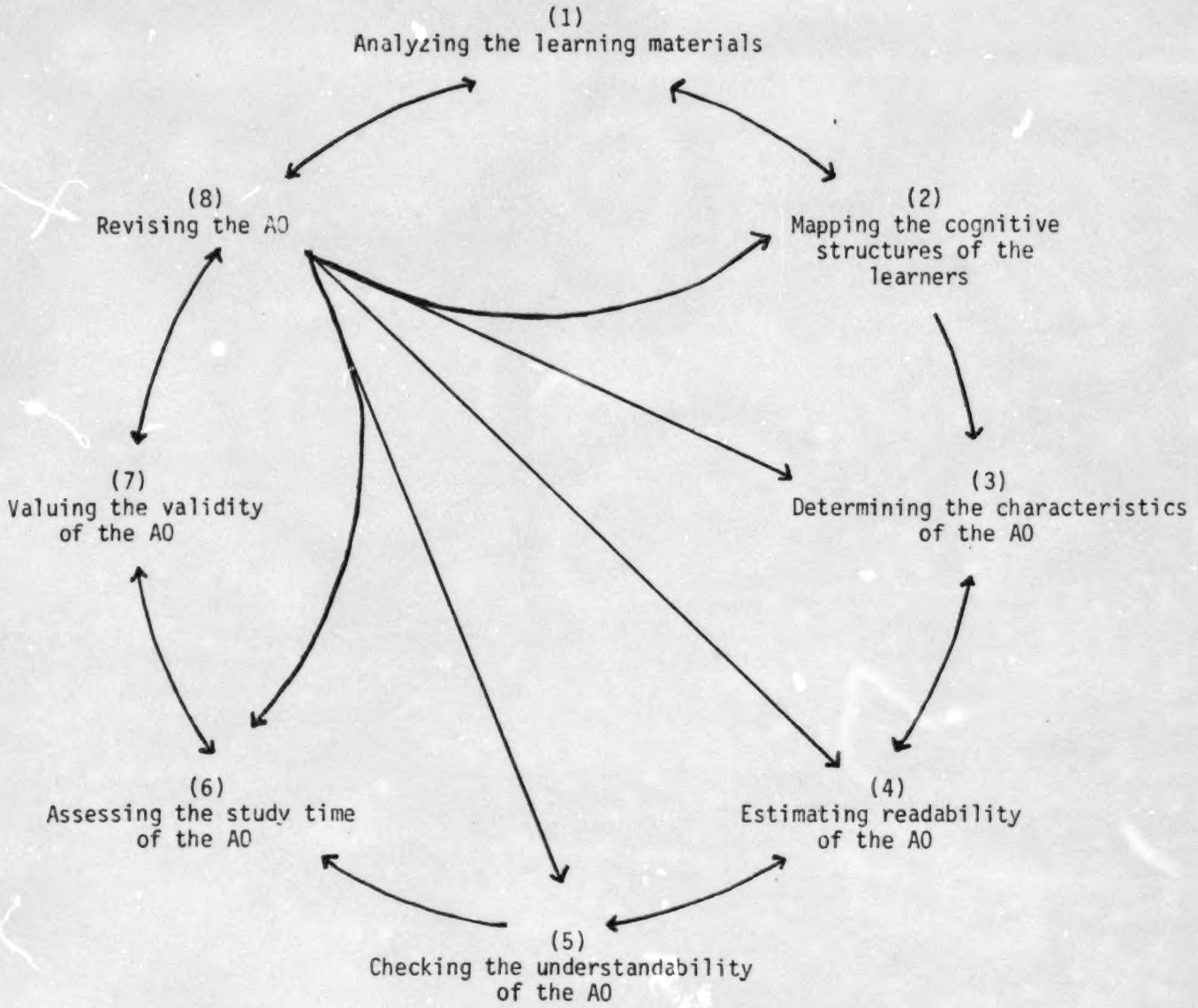

Figure 1: Steps of constructing the advance organizer (AO).

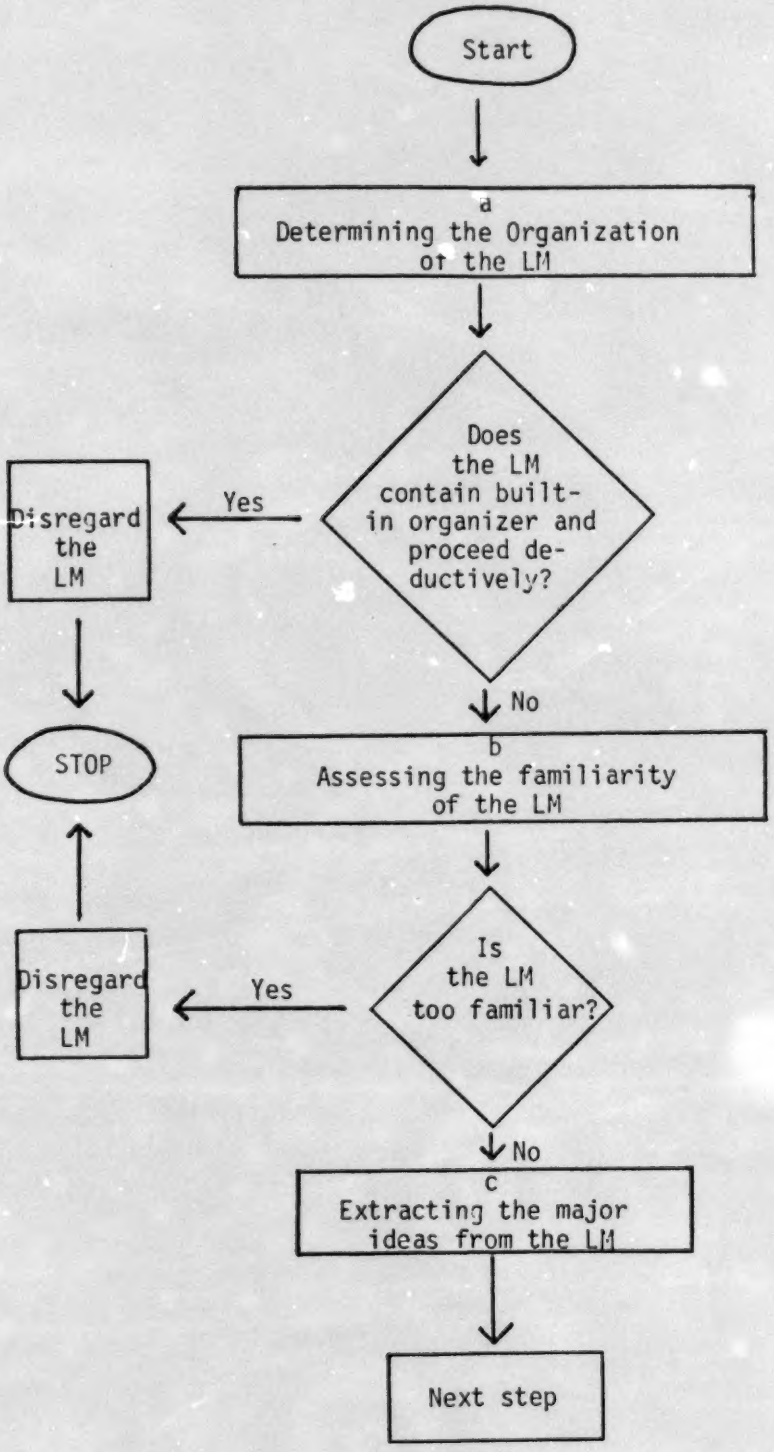

Figure 2: Flow chart analysis of learning materials (LM).